Effects of Nia Exercise in Women Receiving Radiation Therapy for Breast Cancer

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Purpose/Objectives: To compare a 12-week nontraditional exercise Nia program practiced at home to usual care on fatigue, quality of life (QOL), aerobic capacity, and shoulder flexibility in women with breast cancer undergoing radiation therapy.

Design: Randomized clinical trial.

Setting: Large community-based hospital in the midwestern United States.

Sample: 41 women with stage I, II, or III breast cancer starting radiation therapy.

Methods: 22 women were randomized to the Nia group and 19 to the usual care group. Those in the Nia group were instructed to practice Nia 20–60 minutes three times per week for 12 weeks. Those in the usual care group were instructed to continue normal activities.

Main Research Variables: Fatigue, QOL, aerobic capacity, and shoulder flexibility.

Findings: Controlling for baseline scores, change over time between groups was significantly different for the women who practiced Nia at least 13 times during the 12-week period; those in the Nia intervention reported significantly less fatigue between weeks 6 and 12, as compared to control group ($p = 0.05$). No statistical differences in QOL, aerobic capacity, or shoulder flexibility were found, but trends favoring Nia were identified.

Conclusions: For women undergoing radiation therapy for breast cancer, Nia can help relieve fatigue. Additional research in arm and shoulder mobility and preservation also may be beneficial.

Implications for Nursing: Oncology nurses are in a unique position to offer suggestions to help manage fatigue, and Nia could be considered as part of a cancer survivorship program.

Knowledge Translation: Exercise is beneficial for women with breast cancer, and interest is growing in nontraditional exercise options. Nia can benefit women with breast cancer undergoing radiation therapy.

Radiation therapy is one of the principle modalities used to treat breast cancer, both as an adjunct treatment for breast-conserving surgery for early-stage disease and for treatment of diseased lymph nodes, tumor excision sites with remaining disease, and metastatic disease. The primary side effects experienced by women undergoing radiation therapy are fatigue and skin changes (Dhruva et al., 2010; Lee, Kilbreath, Refshauge, Herbert, & Beith, 2008; Lee, Kilbreath, Refshauge, Pendlebury, et al., 2008; Merriman et al., 2010; Schmidt et al., 2012; Sjövall, Strömbeck, Löfgren, Bendahl, & Gunnars, 2010; Thomas-Maclean et al., 2008).

As many as 80% of patients receiving radiation therapy for cancer experience fatigue (Hofman, Ryan, Figueroa-Moseley, Jean-Pierre, & Morrow, 2007; Mustian et al., 2009; Schmidt et al., 2012; Sjövall et al., 2010; So et al., 2009). One study (N = 218) found that 84% of women with breast cancer receiving radiation therapy reported fatigue (Hofman et al., 2005). Patients describe cancer-related fatigue as different from typical fatigue, with more rapid onset, higher intensity, more energy draining, longer lasting, and greater unpredictability. In addition, cancer-related fatigue can cause physical, social, spiritual, psychological, and cognitive distress (Holley, 2000). Specific changes in sleep and mood disturbances have been reported (Garrett et al., 2011; Goldstein et al., 2012).

Skin changes from radiation therapy include erythema and desquamation, which can cause the skin to feel tight, stiff, and even painful. Those sensations, coupled with any scar tissue from surgical intervention or as a result of radiation, can cause women to limit their arm and shoulder movements, which can lead to protective posturing, restricted shoulder mobility, muscle disuse, and pain. In a systematic review of 32 studies evaluating upper-limb problems following surgery and radiation for early breast cancer, as many as 68% of women reported shoulder and arm pain, up to 67% reported restricted shoulder movement, and up to 28% reported arm weakness in the five years following treatment (Lee, Kilbreath, Refshauge, Herbert, et al., 2008). Lymphedema following surgery or radiation therapy can complicate

arm movement and function even more (Smoot et al., 2010), adversely affecting quality of life (QOL) (Nesvold, Reinertsen, Fosså, & Dahl, 2011).

Numerous studies have indicated that exercise during and after cancer therapy can improve physical functioning, QOL, and cancer-related fatigue in women with breast cancer (Schmitz et al., 2010). Most exercise studies in cancer survivors use traditional aerobic or resistance exercises; however, findings from nontraditional exercise interventions that focus on body, mind, and spirit are beginning to appear in the literature (Appling, Scarvalone, MacDonald, McBeth, & Helzlsouer, 2012; Sandel et al., 2005; Stan et al., 2012; Vadiraja et al., 2009). A study of 88 women with stage II and III breast cancer randomized to 60 minutes of daily yoga demonstrated a significant reduction in fatigue over time compared to a supportive therapy control group ($p = 0.01$) (Vadiraja et al., 2009). Another study enrolled 13 women following mastectomy for stage I–IIIA breast cancer in a 12-week structured Pilates mat exercise program (Stan et al., 2012). Significant improvements over time were seen in abduction of the affected shoulder ($p = 0.002$) (Stan et al., 2012). In addition, the Lebed Method of dance and movement has been studied in women with breast cancer following surgery (Sandel et al., 2005). A randomized, controlled trial with a crossover design compared a 12-week intervention using the Lebed Method immediately following surgery to a delayed intervention that started 14 weeks after surgery (Sandel et al., 2005). Participation in the method, whether early or late, increased shoulder range of motion on the affected side. Although the interaction between time and group was not significant, a trend existed for greater arm movement with the intervention.

Another nontraditional exercise that may be helpful during rehabilitation from breast cancer and treatment is Nia, which focuses on the body, mind, and spirit. Nia is a cardiovascular and whole-body conditioning program that integrates five sensations: strength, flexibility, mobility, agility, and stability (Rosas & Rosas, 2004). Nia is based in nine movement forms: three martial arts (Tai Chi, Tae Kwon Do, and Aikido), three dance arts (jazz dance, modern dance, and Duncan dance), and three healing arts (yoga, the teachings of Moshe Feldenkrais, and the Alexander Technique). Collectively, those movements provide a flexible physical activity framework that allows individuals to direct movements according to their own needs. The practice of Nia can be gentle for individuals with a sedentary lifestyle or challenging for those with an active lifestyle (Rosas & Rosas, 2004). Therefore, the adaptive nature of Nia may be of enhanced benefit to individuals with cancer.

Two studies testing Nia have been reported in the literature. A convenience sample of 77 female college students were assigned to either an aerobics class ($n = 37$) or a Nia class ($n = 40$); both classes were taught by the same instructor for one hour twice a week for seven weeks (Kern & Baker, 1997). Results from the study supported a core aspect of Nia—listening to the body. Participants in the Nia class reported being able to "let go" while practicing Nia and incorporated breathing techniques outside of the class. In addition, participants reported feeling less stressed and more calm and relaxed (Kern & Baker, 1997). A pilot study of 19 women with a history of breast cancer were randomized to a prescribed walking routine or Nia (Lopez, Bensen, Guillen, Kurker, & Johnson, 2001). Those in the Nia group had a significant reduction in anxiety ($p = 0.02$). Results also indicated a reduction in depression and improved immune function; however, neither was statistically significantly different between groups.

The purpose of the current study was to compare the effects of a 12-week Nia program to usual care in women with breast cancer undergoing radiation therapy to further test Nia in cancer and cancer treatment rehabilitation. The main outcome variables studied were fatigue, QOL, aerobic capacity, and shoulder flexibility.

Methods

Framework

The conceptual framework that guided this study was the Roy Adaptation Model (Roy & Andrews, 1991), which is based on the assumption that the person is a biopsychosocial being in constant interaction with a changing environment. To cope with a changing world, the person uses innate and acquired mechanisms that are biologic, psychological, and social in origin. Incoming stimuli (e.g., focal, contextual, residual) activate the person's coping mechanisms. Focal stimuli are those most immediately confronting the person (e.g., a cancer diagnosis). The contextual stimuli are all other stimuli present in the situation that contribute to the effect of the focal stimuli (e.g., personal life stressors). Residual stimuli are environmental factors that may be affecting the situation (e.g., prior experience with complementary medicine). The person's modes of adaptation (physiologic and psychosocial) elicit a response (adaptive or maladaptive). The physiologic mode is associated with the way the person responds as a physical being to stimuli from the environment. The psychosocial mode consists of three domains (self-concept, role function, and interdependence) that similarly are associated with the way the person responds to stimuli from the environment. The adaptive or maladaptive response elicited from these modes of adaptation then serve as feedback that affects the perception and processing of incoming stimuli. Adaptive responses promote the integrity and wholeness of the person, which is a goal of nursing practice.

The Roy Adaptation Model has proven useful in the study of various aspects of nursing care (Yoder, 2005), including psychological distress (Yeh, 2003), sleep

(Huang, Carter, & Guo, 2004; Young-McCaughan et al., 2003), and pain (Tsai, Tak, Moore, & Palencia, 2003). Figure 1 illustrates the relationship between the components of the Roy Adaptation Model and the current study's variables. The focal stimuli were the diagnosis and treatment of cancer. Contextual and residual stimuli all affect the patient's coping mechanisms and, in turn, the patient's modes of adaptation. Responses to previous stimuli modulate the processing of new stimuli affecting adaptation. In the current study, Nia was tested as an intervention to facilitate positive adaptation, as evidenced by reduced fatigue, improved QOL, increased aerobic capacity, and increased shoulder flexibility.

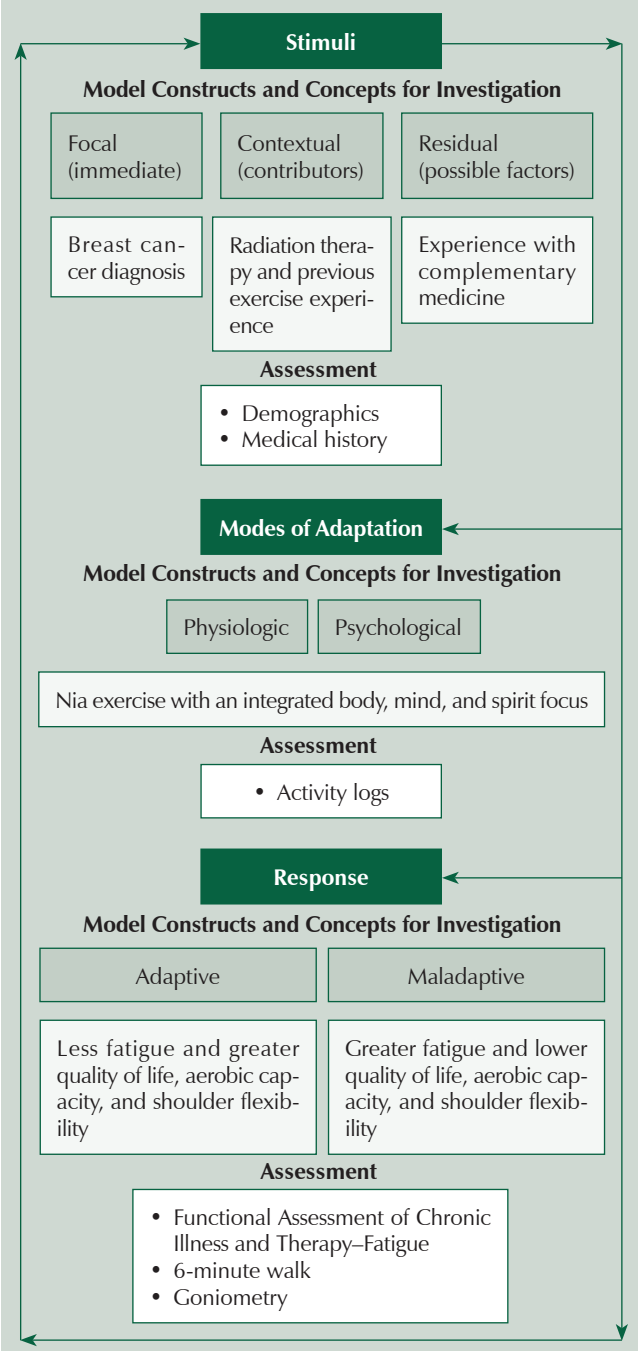

Figure 1. Investigating the Effects of Nia Exercise in Women Receiving Radiation Therapy for Breast Cancer Using the Roy Adaptation Model

Note. Based on information from Roy & Andrews, 1991; Young-McCaughan et al., 2003.

Setting and Sample

The study was approved by the ProMedica Health System institutional review board and conducted at Flower Hospital, a community-based hospital in northwest Ohio. All women aged 18 years and older receiving radiation therapy for stage I, II, or III breast cancer were invited to participate in the study conducted from November 2008 to January 2010.

Study Design

This was a randomized, controlled study. Randomization was stratified by stage of disease (I, II, III) and age (59 years or younger, 60 years and older) in an attempt to ensure equal representation of these groups in both interventions. Participants were assessed for fatigue, QOL, aerobic capacity, and shoulder flexibility at baseline, 6 weeks, and 12 weeks. Because some women required more than six weeks of radiation therapy, the timing of the three assessments was altered slightly to correspond to the start of radiation therapy, the completion of radiation therapy, and six weeks after completion.

Intervention

Nia group participants met individually with the principal investigator. Participants received instructions and a demonstration about the Nia techniques and a Nia DVD for home use. Participants were advised to practice Nia 20–60 minutes at least three times per week for 12 weeks and record their activities in an exercise log. At 6 weeks and 12 weeks, participants met individually with the principal investigator and discussed variations in movement to enhance Nia practice.

Control group participants also met individually with the principal investigator. Participants were instructed to maintain their current exercise regimen and record their activities in an exercise log. At 6 weeks and 12 weeks, participants met individually with the principal investigator and discussed topics such as physical, emotional, mental, and spiritual well-being. Following the 12-week assessment, participants in the control group were given the opportunity to participate in a group Nia class (offered outside of the study) and were given the Nia DVD.

Measures

Demographics: Demographic data, exercise history, cancer diagnosis, and treatment information were collected at the beginning of the study. A medical record review was completed by a member of the research team. Participants completed the **demographic questionnaire**.

Fatigue and quality of life: Fatigue and QOL were assessed using the **Functional Assessment of Chronic Illness Therapy–Fatigue (FACIT-F) scale** (version 4). The FACIT-F is a 40-item questionnaire specific to the cancer population that assesses fatigue and four domains of QOL (physical, social or family, emotional, and functional well-being). Total scores range from 0–160, with higher scores indicating less fatigue. FACIT-F has good test-retest reliability (r = 0.87) and strong internal consistency (coefficient alpha = 0.95); the fatigue subscale showed good stability (r = 0.9) and internal consistency (coefficient alpha = 0.95) (Yellen, Cella, Webster, Blendowski, & Kaplan, 1997). Four scores can be calculated from the questionnaire: (a) a general summary score or **Functional Assessment of Cancer Therapy–General (FACT-G)** (the FACT-G scale is the sum of the four domain scores: physical, social or family, emotional, and functional well-being), (b) a summary index of physical and functional outcomes or the trial outcome index, (c) a fatigue subscale reflecting a sum of responses to specific concerns about fatigue, and (d) a summary fatigue score or FACIT-F total score (the FACIT-F total score is the sum of the four domain scores and the fatigue subscale score). For all FACIT scales and symptom indices, higher scores indicate better QOL.

Aerobic capacity: The **six-minute walk test (6MWT)** was used to assess aerobic capacity (ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories, 2002). A systematic review of 29 studies using the 6MWT showed good correlations (r = 0.51–0.9) between the 6MWT and maximal oxygen consumption and that a change in distance walked of at least 177 feet (54 meters) was clinically significant (Solway, Brooks, Lacasse, & Thomas, 2001). Participants in the current study walked on a 100-foot tiled corridor that was marked at 10 foot intervals (every 3 meters). The starting line and turnaround point were marked with brightly colored tape. The 6MWT was self-paced; study participants were permitted to stop during the six minutes. The total number of laps walked plus any additional distance was rounded up to the nearest foot. If a participant was unable to walk for six minutes, the test was stopped and the reason documented on the data collection form.

Shoulder flexibility: Shoulder flexion and shoulder extension were assessed using a **goniometer**. The published intratester and intertester reliabilities using a goniometer to assess shoulder mobility are high, ranging from 0.83–0.97 (Norkin & White, 2003). In the current study, shoulder flexion was measured by having participants stand with the palms of their hands facing the body and placing the goniometer over the acromion process with the stationary and moving arm of the goniometer aligned at the midline of the humerus. Keeping the stationary arm in place, participants raised their arm. Shoulder extension was measured by placing the goniometer over the acromion process, with the stationary and moving arms of the goniometer aligned at the midline of the humerus. Participants turned their heads away from the shoulder and kept their elbow slightly bent, lifting the arm as far as able. For both flexion and extension, the degree of movement was measured on the moving arm and recorded.

Table 1. Demographic Characteristics (N = 41)

Characteristic	All Participants	Nia (n = 22)	Control (n = 19)
Age (years)			
Range	34–85	34–76	40–85
$\bar{X}$	56	54	59
SD	11	11.1	10.7
Median	55	52	57
Characteristic	**n**	**n**	**n**
Ethnicity			
Caucasian	37	20	17
African American	3	1	2
Other	1	1	–
Marital status			
Married	28	16	12
Divorced	8	3	5
Widowed	3	2	1
Never married	2	1	1
Highest educational degree			
High school diploma or GED	12	6	6
Associate or specialized training	12	5	7
Bachelor's	11	7	4
Master's	5	3	2
Doctoral or other professional	1	1	–
Employment			
Full-time	19	14	5
Part-time	10	3	7
Retired	10	4	6
Unemployed	2	1	1
Body mass index (BMI)			
Range	21–49	21–48	22–49
$\bar{X}$	29	29	30
SD	6.3	6.3	6.5
Median	27.7	27.2	28.7
Normal weight (BMI 18.5–24.9)	10	7	3
Overweight (BMI 25–29.9)	13	6	7
Obese (BMI 30 or higher)	18	9	9

Data Analysis

Descriptive statistics were used to summarize participant characteristics. Chi-square tests were used with categorical data to evaluate differences between groups. Repeated-measures analysis of variance (ANOVA) and

repeated-measured analysis of covariance were used to assess change over time between the groups.

Results

Demographics

Forty-one women agreed to participate; 22 were randomized to the Nia group and 19 were randomized to the control group. The women's ages ranged from 34–85 years ($\bar{X}$ = 56.1), and the majority was Caucasian (see Table 1). The two groups did not differ statistically in their demographics, although clinical differences appear to exist in age and employment, with the Nia group aged, on average, five years younger and more likely to be working full time than the control group.

Cancer History

More than half of the women had stage I disease and 42% had positive lymph nodes (see Table 2). The majority of the women underwent lumpectomy. The women typically started hormonal therapy after chemotherapy and radiation therapy, but they may have received hormonal therapy in the past. Exposure to chemotherapy and hormonal therapy was similar between the groups and was not considered to differentially influence outcome measures. The two groups of women did not differ in their cancer history.

Table 2. Participants' Breast Cancer History Information (N = 41)

Characteristic	All Participants	Nia (n = 22)	Control (n = 19)
Time since diagnosis (months)			
Range	1–13	1–11	2–13
$\bar{X}$ (SD)	5	4	5
SD	3.1	2.9	3.2
Median	4	3	5
Characteristic	**n**	**n**	**n**
Stage			
I	21	12	9
IIA	7	2	5
IIB	5	4	1
IIIA	5	2	3
IIIC	3	2	1
Type of surgery			
Lumpectomy	23	12	11
Mastectomy	8	5	2
Partial mastectomy	7	4	4
Reconstruction	6	1	2
Bilateral mastectomy	3	3	3
With positive lymph nodes	17	8	9
Other treatment[a]			
Hormone therapy	26	10	9
Chemotherapy	19	13	13

[a] Participants could choose more than one, if applicable.

Exercise History and Frequency of Nia and Exercise

Sixty-six percent of participants (n = 27) reported engaging in aerobic activity for at least three 20-minute sessions per week prior to the cancer diagnosis. About 74% of those women (n = 20) continued to exercise during radiation therapy. No significant difference existed in the exercise history of the Nia group compared to the control group.

Adherence to group assignment and activity instruction was assessed by reviewing participant logs. Unfortunately, the logs were not uniformly maintained. At 12 weeks, women randomized to the Nia group reported performing Nia 0–34 times, or an average of about twice a week. Those women reported engaging in other aerobic exercise as well for an average of almost twice a week, for a total of four days a week performing Nia and other aerobic exercise. Women in the control group reported engaging in aerobic exercise 0–41 times, or an average of almost three days per week. The frequency of exercise activities did not change significantly over time for either group. However, the women randomized to the Nia intervention reported engaging in aerobic exercise as well as Nia, and their reported frequency of aerobic exercise did not change. In that way, the Nia group appeared to be more active (practicing Nia in addition to aerobic exercise an average of four days per week) than the control group (who maintained their aerobic exercises an average of three days per week at both time periods). One woman in the Nia group and two in the control group failed to complete the 12-week assessment (see Table 3).

As can happen with intervention studies (Pinto, Rabin, & Dunsiger, 2009; Young-McCaughan & Arzola, 2007), intervention adherence varied. In the current study, 12 of the 22 women randomized to Nia practiced the program at least 13 times in the 12-week period. Because changes in the outcome variables cannot be attributed to the intervention if the women did not practice Nia, the statistical analyses for fatigue, QOL, aerobic capacity, and shoulder flexibility presented here compare the 12 women who practiced Nia to the 17 women randomized to the control group for whom data were collected at baseline, 6 weeks, and 12 weeks.

Fatigue and Quality of Life

As expected, more fatigue and less QOL were reported by the women at 6 weeks (compared to baseline) as they were completing therapy, with improvements reported at 12

weeks. Planned repeated-measures ANOVA comparing the fatigue and QOL measures between the two groups over time were nonsignificant. Because of the clinical differences in the groups as well as the differences in the outcome measures at baseline, a repeated-measures analyses of covariance comparing the Nia intervention to the control condition at 6 weeks and 12 weeks were conducted. Controlling for the baseline assessment of fatigue, the interaction of change in fatigue (FACIT-F total score) over time between groups was significant (p = 0.05), with the Nia group increasing their FACIT-F total score by almost 17 points between 6 and 12 weeks as compared to the control group who increased their FACIT-F total score by only four points; higher scores indicated less fatigue (see Table 4). Although no statistical differences in QOL were found, trends favoring Nia were identified.

Table 3. Participant Nia Practice and Aerobic Exercise Characteristics

	Baseline to Week 6				Weeks 6–12			
Variable	**$\bar{X}$**	**SD**	**Per Week**	**Range**	**$\bar{X}$**	**SD**	**Per Week**	**Range**
Number of days practiced Nia[a]	13	10.6	2.2	0–34	11	10.8	1.8	0–34
Number of days engaged in aerobic exercise								
Nia group[a]	11	8.6	1.8	0–32	11	7.7	1.8	1–31
Control group[b]	17	13	2.8	0–42	17	12.9	2.8	0–41

[a] n = 22
[b] n = 19

Aerobic Capacity, Shoulder Flexibility, and Overall Experience

Aerobic capacity improved at all time points, with clinically significant improvements in distance walked (189 feet) between baseline and 12 weeks; however, no statistically significant differences between the Nia and control groups were found (see Table 5). Right and left shoulder flexion and extension improved at all time points; however, no statistically significant differences between the Nia and control groups were found.

The Nia participants were overwhelmingly positive about participating in Nia. Both the women and their healthcare providers have enthusiastically embraced Nia as an adjunct to therapy. The positive experience is further supported by the participants' comments expressed in the evaluation.

> The Nia movements are really wonderful. They really do help bring awareness to one's body and the areas that have changed.

> The DVD was great because you can modify the moves according to your strength.

> I really think the Nia movements helped me regain flexibility, strength, and mobility. I would highly recommend Nia for women healing from cancer.

Discussion

The current study found that, controlling for baseline scores, the women who practiced Nia at least once a week for 12 weeks experienced a significant improvement over time in the composite score of physical well-being, social well-being, emotional well-being, functional well-being, and fatigue (FACIT-F total score) (p = 0.05), supporting the notion that Nia can positively affect cancer-related fatigue as compared with usual care. The statistical differences appreciated between the groups and over time can be attributed to the differences in reported FACIT-F total score at baseline (the Nia group was five points lower than the control group), the five-point drop in FACIT-F total score at 6 weeks by the Nia group but not the control group (which stayed stable), and the 16-point increase in FACIT-F total score at 12 weeks by the Nia group (control group only increased two points). A minimally important difference for the FACIT-F scales is three points (FACIT.org, 2007). A minimally important difference was observed in the Nia group from 6–12 weeks, as well as between the Nia group and control group at 12 weeks. The pattern observed in the Nia group of increasing fatigue with radiation therapy and recovery during the following six weeks was expected. Why the control group did not appear to experience the expected fatigue with radiation therapy is unclear. Potentially knowing they were randomized to the control condition in a study of fatigue may have caused the women to under-report the fatigue they were experiencing. Additional study with more participants is warranted.

Notably, the composite score of fatigue showed significant differences, whereas the individual measures did not. That perhaps speaks to the multimodal nature and complexity of fatigue, and deserves investigation in future studies. Although the evidence clearly supports traditional exercise as an effective intervention for cancer-related fatigue (Mitchell, Beck, Hood, Moore, & Tanner, 2007), not all individuals with cancer can engage in high-intensity activities. The current study supports Nia as an alternative to traditional aerobic and strengthening exercise programs. The Nia program could be particularly helpful for individuals seeking to control symptoms during treatment and return to maximal functioning as soon as possible after treatment.

Table 4. Changes in Fatigue and Quality of Life Between Weeks 6 and 12 in Participants Adherent to Their Group Assignment (N = 29)

	Baseline		Week 6		Week 12	
Variable	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Fatigue subscale (range 0–52)						
All participants	40	10.63	39.1	10.58	43.5	6.95
Nia group	38.5	12.46	37.8	11.91	45.2	5.32
Control group	41.1	9.39	40.1	9.8	42.3	7.84
FACIT-F Trial Outcome Index[a] (range 0–108)						
All participants	85.9	17.86	82.7	17.66	90.8	13.61
Nia group	82.4	20	79.8	19.15	93.2	11.61
Control group	88.3	16.38	84.6	16.92	89.2	14.98
Physical well-being (range 0–28)						
All participants	24.4	3.64	22	4.48	24.6	3.09
Nia group	23.8	4.04	22.2	4.84	25.2	2.52
Control group	24.9	3.39	21.9	21.9	24.2	3.45
Social or family well-being (range 0–28)						
All participants	23.9	5.46	23.2	6.04	23.2	4.58
Nia group	24.3	4.35	21	7.96	23.2	4.06
Control group	23.6	6.24	24.7	3.78	23.2	5.03
Emotional well-being (range 0–24)						
All participants	19	2.93	20.4	2.33	20.6	3.15
Nia group	19.2	2.37	19.7	2.19	20.5	3.45
Control group	18.9	3.34	20.9	2.36	20.6	3.15
Functional well-being (range 0–28)						
All participants	21.4	5.02	21.5	6.05	22.8	4.68
Nia group	20.1	4.91	19.9	7.86	22.8	4.57
Control group	22.3	5.02	22.6	4.29	22.7	4.9
FACT-G[b] (range 0–108)						
All participants	88.8	12.39	87.1	13.22	91.1	10.83
Nia group	87.3	12.58	82.8	15.89	91.7	10.96
Control group	89.8	12.55	90.1	10.42	90.6	11.06
FACIT-F Total Score[c] (range 0–160)						
All participants	128.8	21.62	126.2	20.76	134.6	16.85
Nia group	125.8	23.51	120.5	22.54	136.8	15.67
Control group	130.8	20.66	130.2	19.07	132.9	16.85

[a] Physical well-being, functional well-being, and fatigue subscales

[b] Physical well-being, social or family well-being, emotional well-being, and functional well-being subscales

[c] Physical well-being, social or family well-being, emotional well-being, functional well-being, and fatigue subscales

FACIT-F—Functional Assessment of Chronic Illness Therapy–Fatigue; FACT-G—Functional Assessment of Cancer Therapy–General

Note. For the Nia intervention group, n = 12; for the control group, n = 17. Total participant count for this analysis is 29.

Note. p value compares Nia intervention to control condition at 6 and 12 weeks controlling for baseline score. Significant interaction was only found for the FACIT-F total score (p = 0.05).

Although no significant difference in shoulder flexibility was seen between the groups, all participants improved their flexibility during the 12 weeks of the study. Arm and shoulder mobility can be preserved with preventive activities and reversed if identified early (Smoot et al., 2010). An early intervention, such as Nia, could prevent arm and shoulder immobility and improve arm and shoulder mobility for women experiencing limitations, which warrants additional investigation.

Only 12 of the 22 participants assigned to the Nia group were adherent to the Nia prescription, practicing Nia 20 minutes at least three times a week for 13 times total. Pinto et al. (2009) found that women with breast cancer who had completed treatment in the past five years participating in a home-based exercise program were most likely to achieve their highest exercise goals in the first few weeks. After that, adherence to home-based exercise decreased. Exercise self-efficacy, or confidence in one's ability to exercise, significantly predicted adherence. Unlike the women in the Pinto et al. (2009) study, the women in the current Nia study all were undergoing radiation therapy, well-known to cause fatigue. The Nia intervention tested in this study also was home-based, with only three interactions with the study investigator. More regular, planned follow-up with participants with educational modifications or suggestions, particularly addressing exercise even on days women are feeling more fatigued, may improve adherence over longer periods of time. Strategies using electronic communication via computer, cell phone, or phone calls on a weekly basis may be helpful. In addition, the use of a step counter or heart rate device may serve not only as an objective measure to quantify exercise data, but as a reminder to exercise and improve adherence.

Limitations

The amount and variation of exercise and other activities the participants engaged in during the 12-week period were surprising. Unfortunately, because the quality of the exercise log entries varied, the data analysis was unable to

reliably isolate the unique contribution of Nia to the study outcomes. In addition, women in both groups reported that having to complete the exercise log every day reminded them to exercise, which was particularly apparent in the control group. Although the research coordinators who conducted the 6MWT and goniometry measures were trained to a standard, the study would have benefited from routinely assessing the fidelity of the measurements to ensure inter-rater reliability for the duration of the data collection. Why the randomization failed to control for the seemingly clinical differences in age and employment status of the two groups is unclear; however, those differences may have affected the results of the study.

Table 5. Changes in Aerobic Capacity and Shoulder Flexibility Between Weeks 6 and 12 in Participants Adherent to Their Group Assignment (N = 29)

	Baseline		Week 6		Week 12	
Variable	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Aerobic capacity (feet)						
All participants	1,300	281.8	1,418	317.3	1,489	349
Nia group	1,364	234.5	1,496	272.2	1,568	259.8
Control group	1,256	309.8	1,363	342.8	1,433	398.4
Shoulder flexibility: Right shoulder flexion (degrees)						
All participants	136	18.3	139	15.7	145	15.2
Nia group	138	15	144	14.5	151	16.2
Control group	134	20.6	135	16.1	141	13.4
Shoulder flexibility: Left shoulder flexion (degrees)						
All participants	138	13.7	140	12.1	146	15.1
Nia group	139	15.5	143	10.7	152	13.2
Control group	138	12.8	138	12.9	142	15.4
Shoulder flexibility: Right shoulder extension (degrees)						
All participants	50	10.7	55	12.4	59	12.6
Nia group	51	10.6	56	11	59	10.5
Control group	50	11	55	13.6	59	14.3
Shoulder flexibility: Left shoulder extension (degrees)						
All participants	51	11.3	55	13.5	56	12.2
Nia group	50	11.8	54	10.8	53	11
Control group	51	11.3	56	15.3	59	12.7

Note. Twelve participants in the Nia group were adherent, with 17 adherent participants in the control group.

Implications for Nursing

The current study contributes to the body of scientific knowledge of nontraditional exercise modalities (i.e., those that encompass a body-mind-spirit approach) in women with breast cancer. Nia could be offered to women undergoing radiation therapy for breast cancer as part of a comprehensive plan to prevent or reduce fatigue. The complex nature of fatigue warrants additional study. Oncology nurses are in a unique position to offer suggestions to effectively manage fatigue, and Nia could be included in cancer survivorship programs. More information about Nia can be found at www.nianow.com.

Conclusions

Future research to assess the benefits of Nia should include a larger, more diverse population and patients with other types of cancer diagnoses. Additional research in arm and shoulder mobility and preservation also may be beneficial.

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